

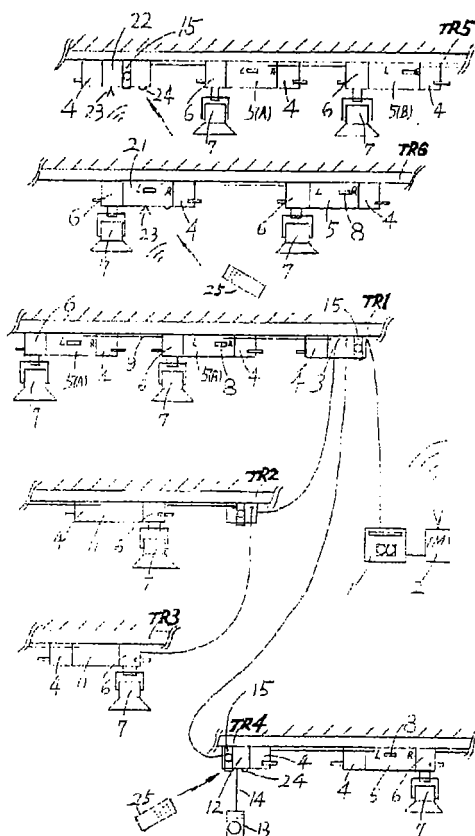
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(54) **SYSTEME DE DIFFUSION AUDIO REPARTI MONTE SUR RAILS**

(54) **TRACK MOUNTED DISTRIBUTED AUDIO BROADCASTING SYSTEM**



(57) L'invention est constituée par un système réparti de diffusion audio monté sur rails comportant des modules montés sur rails pour l'amplificateur de puissance audio, le bloc d'alimentation, le système de sonorisation, les amplificateurs tampons, le syntoniseur et un contrôleur local. Le signal audio est réparti par l'intermédiaire d'un conducteur blindé et le niveau du signal est compatible avec le niveau de sortie d'un préamplificateur. Le module de l'amplificateur de puissance audio est doté d'un sélecteur permettant de choisir le canal gauche ou le canal droit. La longueur du conducteur de signaux peut être ajustée au moyen d'une bobine incorporée au module du système de sonorisation. L'ensemble du système est facile à installer et à relocaliser et réduit l'encombrement.

(57) A track mounted distributed audio broadcasting system comprises track mounted modules of audio power amplifier, power supply, speaker system, buffer amplifiers, tuner, and a local area controller. The audio signal is distributed via a shielded signal wire and the signal level is compatible with the output of a preamplifier. The audio power amplifier module has a selector switch to select left or right channel. The signal wire length can be adjusted by a reel apparatus inside the speaker system module. The whole system is easy to install or relocate, and saves floor space.



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#### Abstract

A track mounted distributed audio broadcasting system comprises track mounted modules of audio power amplifier, power supply, speaker system, buffer amplifiers, tuner, and a local area controller. The audio signal is distributed via a shielded signal wire and the signal level is compatible with the output of a preamplifier. The audio power amplifier module has a selector switch to select left or right channel. The signal wire length can be adjusted by a reel apparatus inside the speaker system module. The whole system is easy to install or relocate, and saves floor space.

This invention relates to an audio broadcasting system which is track mounted, easy to install, flexible to relocate, saves floor space and is remote controllable.

An audio broadcasting system is common and sometimes indispensable in many occasions and places. A conventional audio broadcasting system usually comprises a central audio signal source and a large audio power amplifier. After being amplified by the audio power amplifier the audio signal is sent out to impedance-matched speaker systems via heavy speaker wires. Usually the speakers are installed in a wall, or flush with the ceiling. Sometimes the speaker box is just left on the floor or hung from a corner of the ceiling. Usually, once a conventional audio broadcasting system is fixed, it is difficult to change.

But on occasion, if the floor layout need to be rearranged or the room size needs to be changed, then the audio system should be rearranged accordingly. In many cases, the modification of an audio system will become a problem and could be solved only at great expense or compromise. In some other cases, the room space is limited and the floor space is valuable and not available for speaker boxes; perhaps there is no false ceiling to facilitate installation of flush speakers.

Installing an audio broadcasting system is difficult. In the situations mentioned above, one may see that an audio system which is easy to install, flexible to rearrange, and needs no floor space for installation would be very welcomed.

For easier explanation, please look at the track mounted lighting system. In the above-mentioned situations, a track mounted lighting system has features also desired in the audio system. It is easy to install, flexible to rearrange location and saves floor space.

But to turn a conventional audio system into a track system, there are some difficulties. Firstly, a track audio system means that the speaker system being used cannot be a flush speaker using a false ceiling as a speaker baffle. A speaker system with enclosure must be used. But a quality speaker system with enclosure is usually heavy and not suitable for track mounting. Secondly, the speaker wire is thick and heavy too. Thirdly, once the wire length is set, the distance between components is fixed, leaving no flexibility and making relocation inconvenient. Fourthly, the audio power amplifier and the speaker system are usually matched, so it is difficult to make any changes.

The spirit of this invention is to provide an audio system to cope with the shortcomings of a conventional audio system. One object of this invention is to provide an audio system compatible with conventional existing track lighting systems which can be installed alone or together with lights in a same track. A further object of this invention is to provide unique features resulting from innovative construction of the system modules comprised in this invention.

The invented audio system distributes audio signals at the voltage level as the output of a preamplifier. The signal at this level is strong enough to resist noise interference, and small enough to use a thin signal wire. A thinner wire is preferred because it is lighter and easier to handle. A shielded stereo type signal wire is used and is provided to each station, so that the signal is protected from radio interference and each amplifier module has a chance to choose its stereo channel. The power supply, audio power amplifier and speaker system are separately designed into different modules to standardized the interface of the power input of each system module, making it compatible with the utility power or the low voltage lamp power. A module system is easier and more economical for production and maintenance. This invention further provides a special wire handling apparatus in the speaker system module to make the extension of the signal wire adjustable. Thus the speaker system location can be adjusted, within a certain range, with great flexibility. The invented audio system also comprises buffer amplifiers for the system expansion and the signal distribution. A local controller is provided to control a partial section of the whole system. The present invention also comprises an FM tuner module to receive the source audio signal being transmitted by a wireless FM transmitter. A wireless system can make the system easier to install, especially when the system covers a wide area. Remote control techniques such as infrared remote controllers can also be integrated into applicable modules to make the system more user friendly and convenient.

The advantages and many possible application combinations of the present invention and the embodiment of each system module will be understood more clearly by the detailed description referring to the following drawings, in which:

Fig.1 shows some possible application combinations of the modules of the present invention track mounting audio system;

Fig.2 shows a power supply module joined with a tuner module;  
 Fig.3 is a perspective view showing the join mechanism in Fig.2;  
 Fig.4 is a sectional view of the supporting device in Fig.1;  
 Fig.5 is a sectional view of a clamp locking in a track;  
 Fig.6 is a sectional view showing the speaker system module and the wire reel apparatus;  
 Fig.7 is a perspective view of Fig.6;  
 Fig.8 is a perspective view of an audio power amplifier;  
 Fig.9 is a schematic showing the wiring of the two input ports and the channel selector switch of an audio power amplifier module; also showing the interface between a power supply module and a power amplifier module; and the interface between a speaker system module and a power amplifier module;  
 Fig.9-1 is a schematic of signal wire connections between audio power amplifiers;  
 Fig.10 is a sectional view of a another speaker system module showing the automatic winding spring means;  
 Fig.11 is a sectional view of the wire supporting device shown in Fig.10;  
 Fig.12 is a sectional view showing the spiral spring of the automatic winding reel in Fig.10;

Referring now to Fig.1, there are six tracks denoted as TR1 to TR6 showing different application combinations of the modules of the present invention. The audio signal source 1 can be any device having an audio output signal level compatible with a preamplifier output, such as: a radio receiver, a CD player, a cassette player or any other audio source. The audio signal is sent to a signal buffer amplifier 3 attached to TR1 via a shielded stereo wire, or transmitted by an FM transmitter 2 to an FM tuner amplifier module 21 attached to TR6 or tuner module 22 attached to TR5.

The buffer amplifier 3 attached to TR1 is a model of three outputs, so that the incoming audio signal can be separated into three tracks: TR1, TR2 and TR4. The buffer amplifier module can be very easily implemented by conventional operational amplifiers and the power consumption is usually small. It is preferred that the buffer amplifier 3 has a similar box construction as the tuner module 22 shown in Fig.1 and Fig. 2 and the same interface plug 34 to join with a socket 38 of a power supply module 4 as shown in Fig.3. Although the buffer amplifier module 3 is not

usually heavy, a supporting device 15 is still provided to provide more security. An embodiment of the supporting device is shown in Fig.3 and Fig.4. On TR1 there are several audio amplifier stations consisting of an audio power amplifier module, a power supply module and a speaker system module. Two of the audio amplifier stations, 5A and 5B are shown. In appearance, the audio power amplifiers are connected in series, but actually they are connected in parallel as shown in Fig. 9 and Fig. 9-1. All the signal wires are shielded stereo type; a selector switch for each audio amplifier module can be used to select a left or a right channel. A speaker system module is shown in Fig.6, comprising a specially designed light-weight speaker 7, wire reel apparatus 6 and clamping mechanisms to lock the module to the track. A light-weight speaker system is not the target of this present invention, so it will not be explained in any further detail.

The wire reel apparatus 6a comprises a manual reel 28a, turning the extended rim of reel 28a; the extension length of signal wire 9 can be adjusted. Wire 9 is connected to plug 31. When a speaker system module is connected with an audio power amplifier module 5, plug 31 is joined to socket 42 as shown in Fig.8 and Fig.9. Wire 9 is connected to plug 31 by resilient sliding conductive contacts 29 as shown in Fig.6 and Fig.10. Fig.7 is a perspective view of the speaker system module and a partial part of an audio power amplifier 5 shown together in Fig. 6. A lever 27 is fastened to clamp 26 mechanically; turning 27 can lock or release the clamp 26 in a track. Fig.5 shows the clamp 26 in the locked position in a track. Stopper screw 32 is used to prevent reel 28 from turning once the length of wire 9 is fixed.

An audio power amplifier module has two signal input ports 42 and 35, each of which can be used as the signal input, and the other one then is for transmitting the audio signal to the next station. The selector switch 8 is used to select stereo channel. L is for the left channel. R is for the right channel. At OFF position the audio amplifier input is grounded. Fig.9 is a schematic drawing showing the signal wire arrangement of an audio power amplifier module 5. Fig. 9-1 is a schematic drawing showing the parallel connection feature of the audio power amplifiers.

The enclosure of audio power amplifier module 5 has a signal socket 42 and a speaker output socket 41. When an audio power amplifier module is

connected with a speaker system module, the corresponding plugs 31 and 30 will be automatically plugged into sockets 42 and 41. At the other end of the enclosure of module 5, there is a plug 34, which will be plugged into socket 38 when connected with a power supply module 4. As shown in Fig.8, at both ends of module 5, the enclosure has recesses to allow module 5 to be materially supported by the power supply module and the speaker system module when they are attached to module 5 and locked into a track. The enclosure of an audio power amplifier module 5 also has holes 36 on plate structures at its four lower corners. When connected with a power supply module and a speaker system module, the small protrusion means 37 at the location corresponding to holes 36 on each module will fit together.

Fig.10 shows a speaker system module comprising an automatic rewind wire reel apparatus 6b. When the wire 9 is pulled out of 6b, the reel 28b will tighten a spiral spring 43 shown in Fig.12. Spring 43 will maintain tension in wire 9. Also shown in Fig.10, is a wire holding device 44. As shown by a sectional view of 44 in Fig.11, signal wire 9 can be hidden in the track TR, for aesthetic considerations.

Referring back to Fig.1 again, on track TR2 the module 10 is simply a passive channel splitter, so power supply is not needed for module 10. TR2 and TR3 are both in the same room, each track is dedicated to one channel. On track TR4, there is a local controller 12. The audio signal and hence the output of the speakers on TR4 is controlled by the local controller module 12 which can be controlled by an accessible control panel 13 via cord 14 or by a remote infrared controller 25 via an infrared receiver 24. On track TR5, there is an FM receiver 22 with antenna 23 to receive signal transmitted by transmitter 2 and an infrared receiver 24 to accept remote control command from a hand-held controller 25. The output of 22 is fed into speaker stations, the same ones as TR1. On track TR6, the module 21 is a tuner with an audio power amplifier, which is usually used with at least one standard speaker station, the same as the ones used on TR1 to form a stereo pair.

The above descriptions are just some embodiment and applications and not a limitation of this invention. Many modifications will become apparent to those experienced in the art, without departing from the spirit of the present invention.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A track mounted distributed audio broadcasting system comprising a track mounted audio power amplifier module, a track mounted speaker system module, a track mounted power supply module, and buffer amplifiers; said track mounted audio power amplifier module having a DC regulator or DC/DC converter to supply power; said audio power amplifier module having two electrically identical audio signal input ports. When either one of the said input ports is being used as the input port of the said amplifier module, the other is being used as the output of the audio signal connecting to the next amplifier or other system module; said input ports accept audio signals via a shielded signal wire; said audio signal being at preamplifier output level or line level; said audio power amplifier having very high input impedance, so that several can be used in parallel; said audio power amplifier module having an output port feeding speaker driving signal to a loudspeaker or speakers in a speaker system module; said track mounted speaker system module comprising a loudspeaker or speakers, and having an input port to accept the output signal of the said audio power amplifier module; said track mounted power supply module having conductive contact means to contact the conductor means inside the track and transform the track power into unregulated DC power for feeding into the said audio power amplifier or other system module; said buffer amplifier means having a gain factor of one, and having at least one output to expand audio output stations or several outputs to distribute audio signals into several tracks;
2. A track mounted audio system as defined in claim 1, comprising a track mounted radio tuner module or other receiver means to receive the audio signal transmitted from a signal source by radio wave or other wireless means, the link between the signal source and the track mounting audio broadcasting system being wireless.
3. As defined in claim 1, wherein the said audio power amplifier comprising wireless remote control means.
4. As defined in claim 2, wherein the said module comprises wireless remote control means.
5. As defined in claim 1, wherein the speaker system module comprising a wire reel apparatus to store signal wire; said wire reel can be turned by hand to wind up excess signal wire; said wire reel apparatus having a



stopper means to lock the reel in the proper position; said wire reel apparatus having a connector means connecting the signal wire to one of the two audio signal inputs of the said audio power amplifier module; said reel apparatus having resilient sliding conductive contacts to connect the audio signal between the said connector means and the wire.

6. As defined in claim 1 and claim 5, wherein the said reel apparatus of the speaker system module having a spiral spring to rewind the signal wire automatically.

7. A track mounted distributed audio broadcasting system as defined in claim 1, comprising a track mounted local controller module to control a group of amplifiers in a local area at the same time; said local control module can be controlled via an accessible control panel or via a wireless remote controller.

8. As defined in claim 1, for implementation, each functional module can be embodied separately or fastened as a whole unit; some modules may be combined in one mechanical case.

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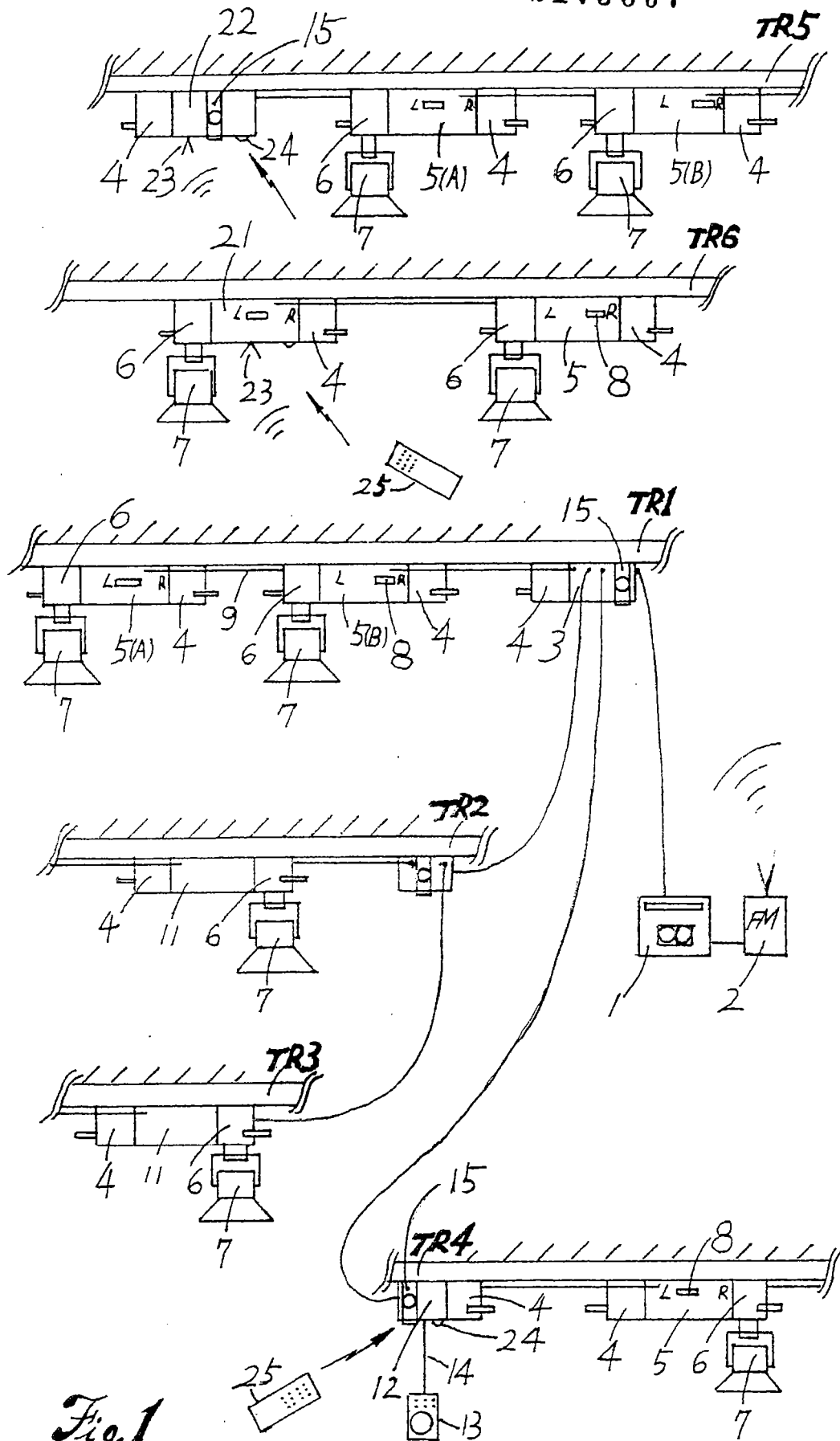


Fig. 1

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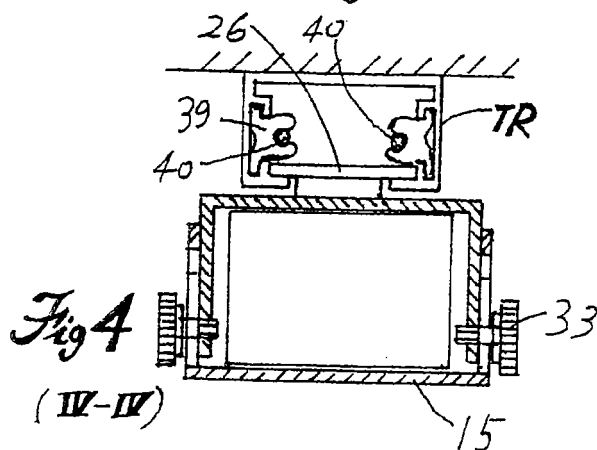
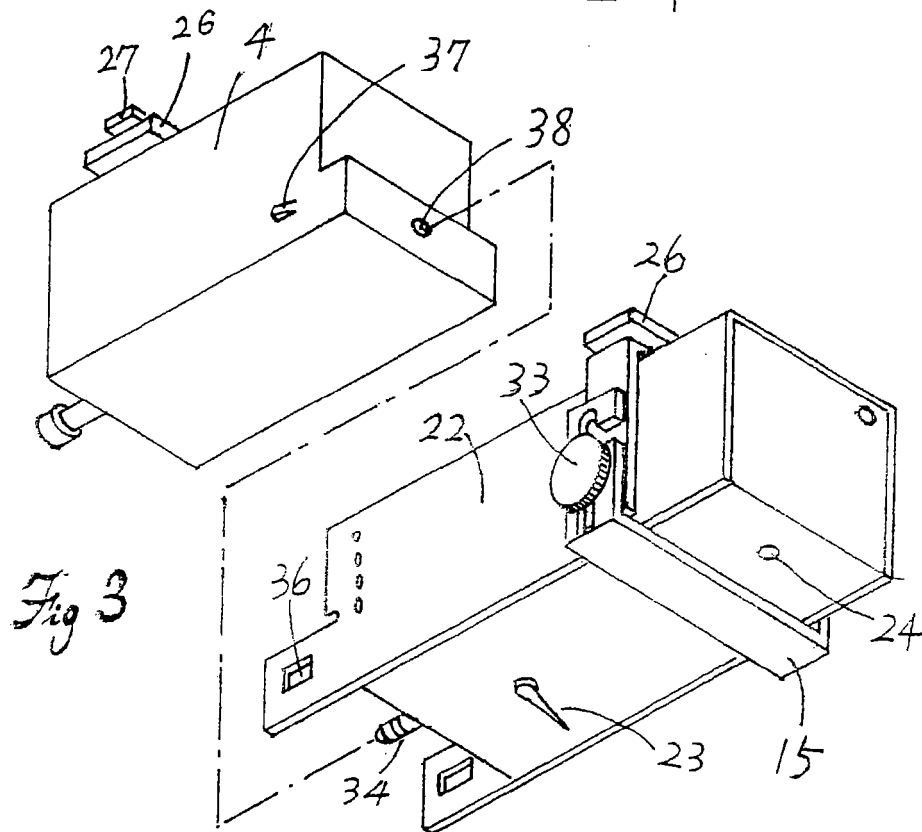
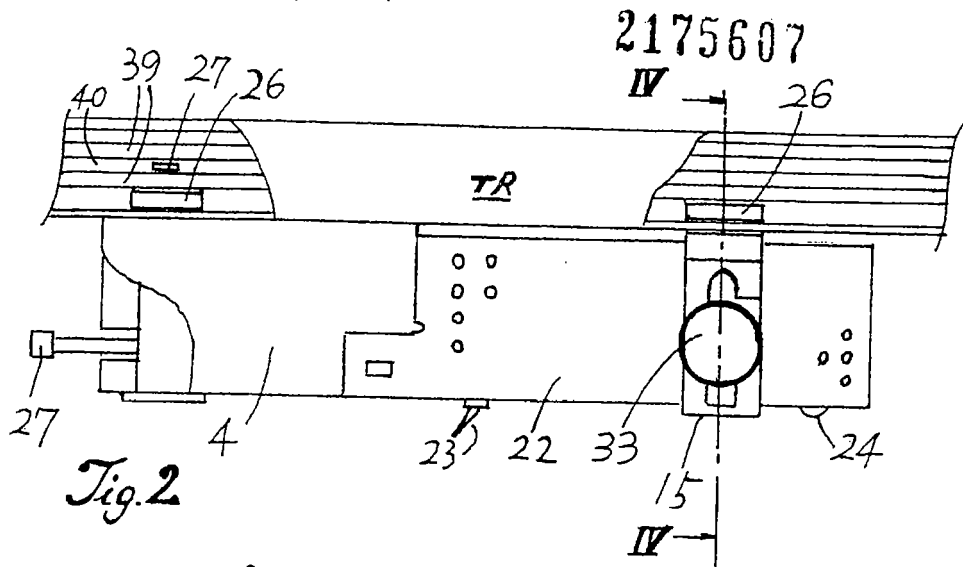


Fig. 5  
V-V

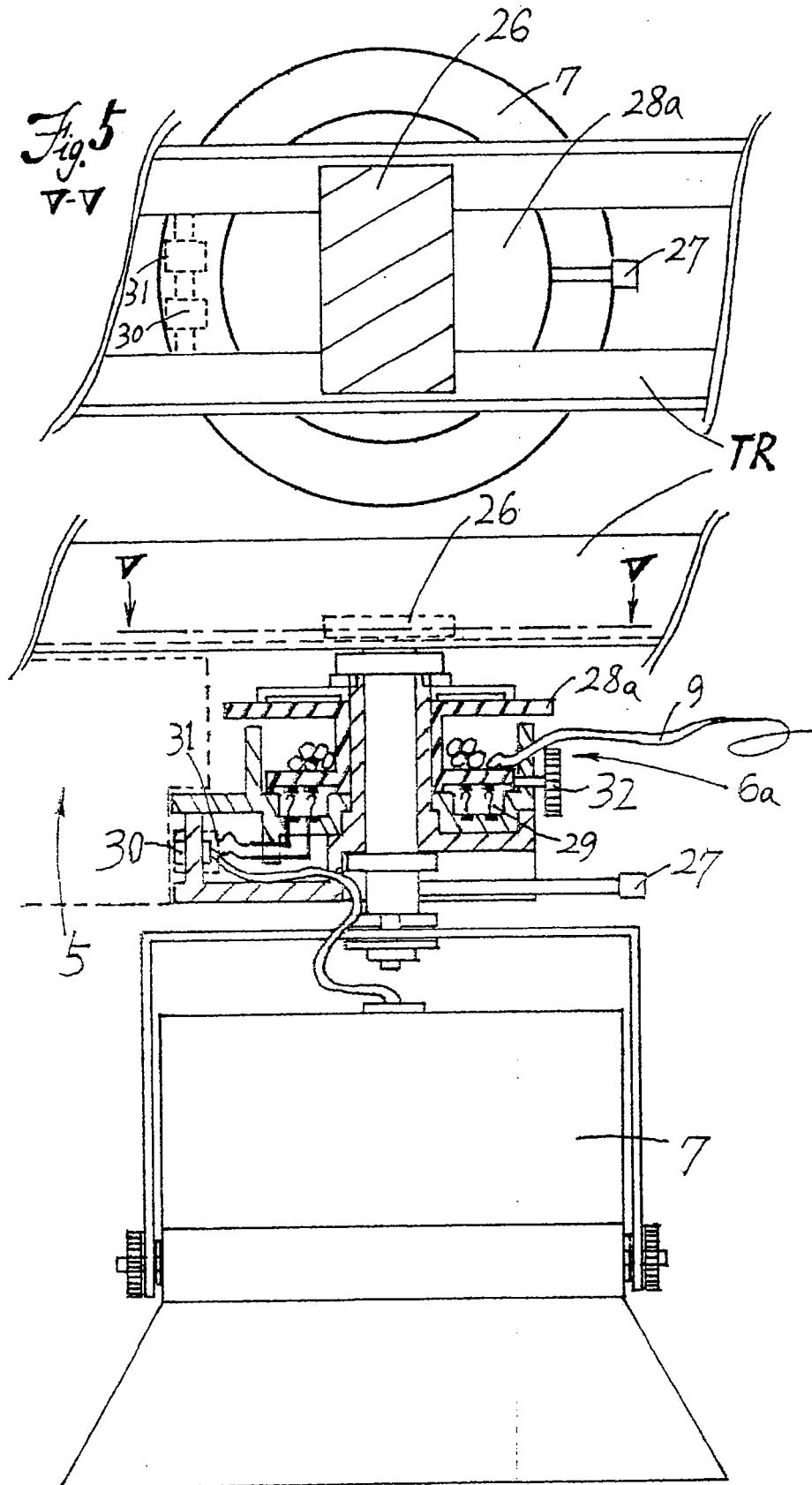
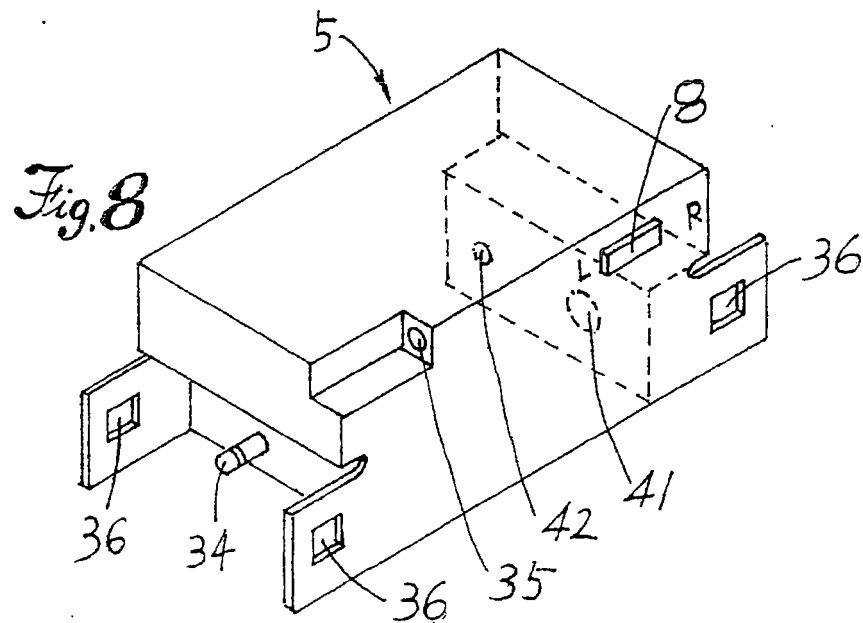
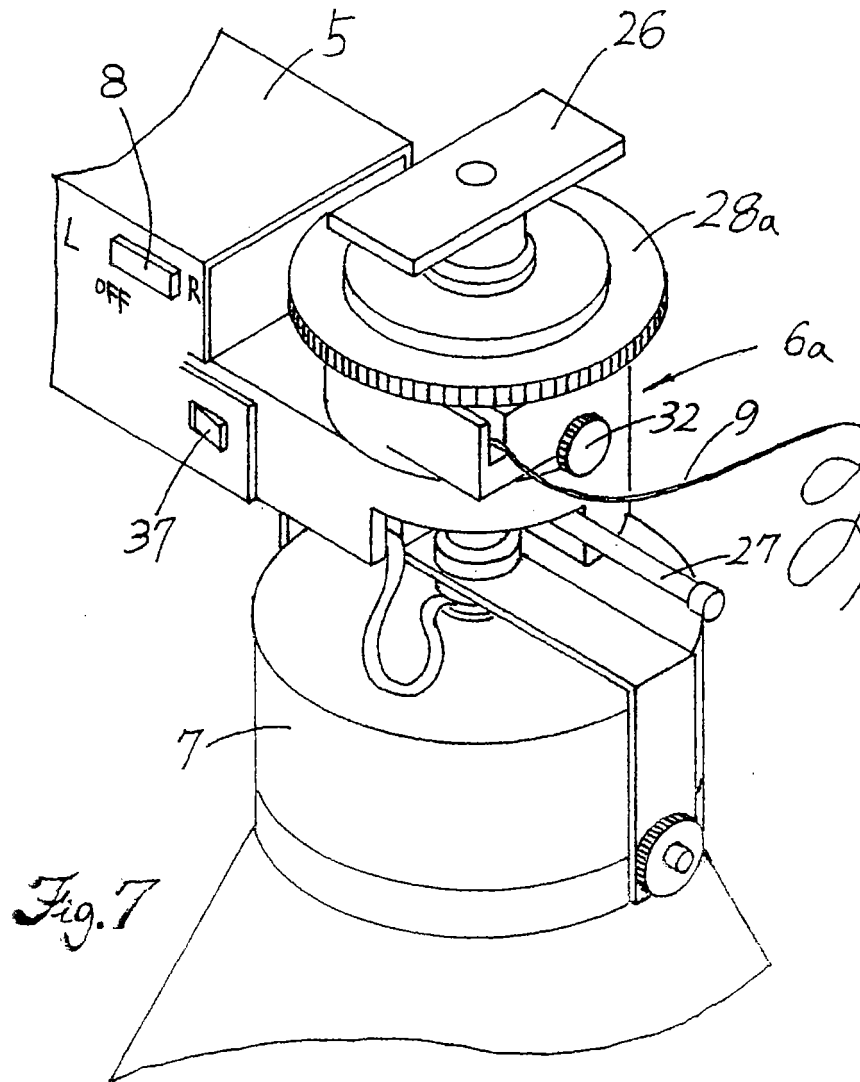


Fig. 6



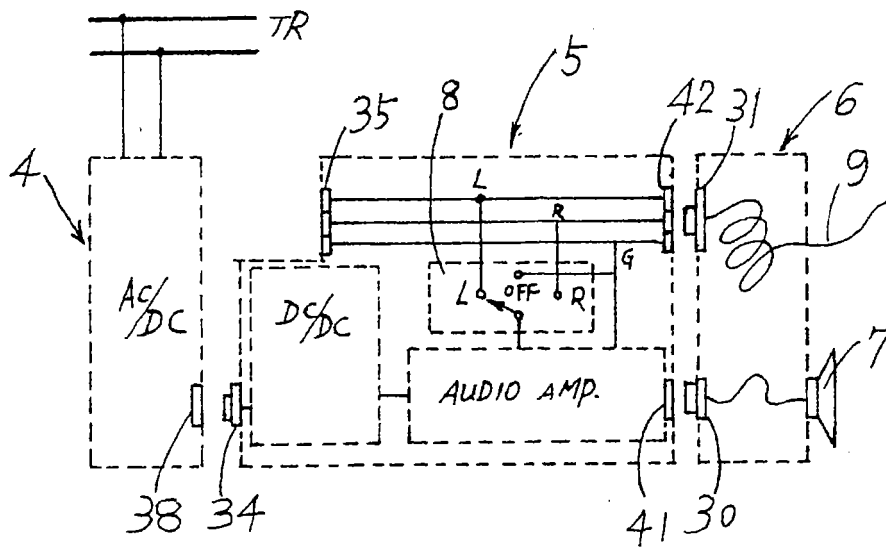


Fig. 9

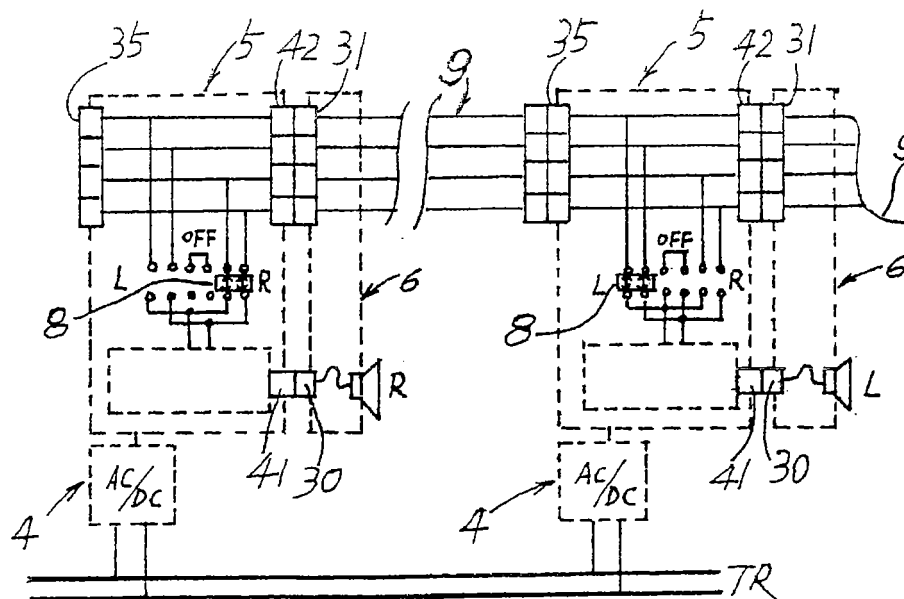


Fig 9-1

